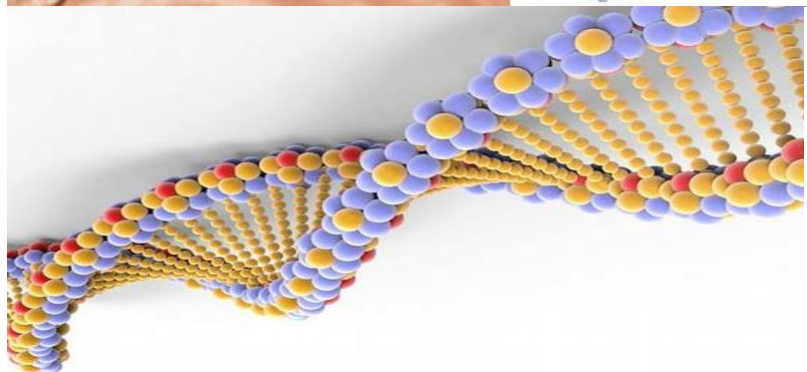
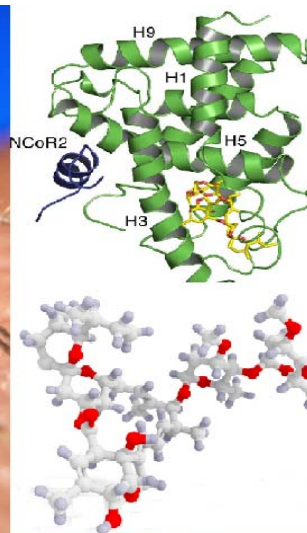


PhytoChem & BioSub Journal

Peer-reviewed research journal on Phytochemistry & Bioactives Substances

ISSN 2170 - 1768



PCBS Journal

Volume 10 N° 2

2016



PhytoChem & BioSub Journal

ISSN 2170 – 1768

Peer-reviewed research journal on Phytochemistry & Bioactives Substances

CAS Source Index (CODEN: PBJHB3)

Editor in Chief

Pr Abdelkrim CHERITI

Phytochemistry & Organic Synthesis Laboratory

08000, Bechar, Algeria

PhytoChem & BioSub Journal (PCBS Journal) is a peer-reviewed research journal published by Phytochemistry & Organic Synthesis Laboratory. The PCBS Journal publishes innovative research papers, reviews, mini-reviews, short communications and technical notes that contribute significantly to further the scientific knowledge related to the field of Phytochemistry & Bioactives Substances (Medicinal Plants, Ethnopharmacology, Pharmacognosy, Phytochemistry, Natural products, Analytical Chemistry, Organic Synthesis, Medicinal Chemistry, Pharmaceutical Chemistry, Biochemistry, Computational Chemistry, Molecular Drug Design, Pharmaceutical Analysis, Pharmacy Practice, Quality Assurance, Microbiology, Bioactivity and Biotechnology of Pharmaceutical Interest). Contributions in all areas at the interface of Chemistry, Pharmacy, Medicine and Biology are welcomed.

Submission of an article to the **PCBS Journal** implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis), that it is not under consideration for publication elsewhere, that its publication is approved by all authors.

The **PCBS Journal** reserves the right to submit all received manuscripts to *ad hoc* referees, whose names will be kept confidential, and will have the authority to decide on the pertinence for acceptance. Referees may send back manuscripts to Editor-in-Chief, for transmission to the author(s) with suggestions for necessary alterations, which are to be made in order to conform to the standards and editorial rules of the Journal. All manuscripts should be prepared in MS-Word format, and submitted online to **Phytochem07@yahoo.fr**. Upon receipt of paper submission, the Editor sends an E-mail of confirmation to the corresponding author within 1-4 working days. The Editors reserve the right to edit or otherwise alter all contributions, but authors will receive proofs for approval before publication.

Editorial Board

Abou Enein H

Pharm. Med Chem Dept. Research Division,
NRC, Dokki, Giza, Egypt

Allali H.

LASNABIO, Dept. Chemistry,
University of Tlemcen, Algeria

Awad Allah A.

Dept. Chem., Faculty of Science, Islamic
University of Gaza, Gaza, Palestine

Barkani M.

Materials Laboratory, Bedjai University,
Algeria

Benharathe N

Materials Laboratory, USTO university, Oran,
Algeria

Boksha I.

Federal Research Centre for Epidemiology
Microbio., MH, Moscow, Russia

Boukir A.

Lab. Applied Chem., Faculty of Science,
S.M.Ben Abdellah Univ., Fez, Morocco

Boulenouar N.

Biochemical Laboratory, Nour E. University, El
Bayadh, Algeria

Daoud K.

GP- Indus.Pharma Laboratory, USTHB, Algiers,
Algeria

El Abed D.

Fine Organic Chemistry laboratory, Es Senia
university, Oran, Algeria

El Omar F.

Applied Chem. Lab., Faculty of Science
Lebanese University, Tripoli, Lebanon

Govender P.

KwaZulu-Natal Univ., School of Life Sci.
Biochem., Durban, South Africa

Gargouri A. F.

Biotechnology center, CBS
Sfax, Tunisia

Gherraf N.

LRNAMS Laboratory, Larbi ben M'hidi,
University, Oum El-Bouaghi, Algeria

Gouasmia A.

Organic Materials Laboratory, faculty of science,
Tebessa University, Algeria

Kajima J.M

COSNA Laboratory, faculty of science, Tlemcen
University, Algeria

Khelil-Oueld Hadj A.

ECOSYS Laboratory, Ouargla, University,
Ouargla, Algeria

Marouf A.

Biochemistry laboratory, Dept of Biology,
Naama University, Algeria

Laouar H

NRV laboratory, Dept. Biology and plant
ecology, F.A. University, Setif-I, Algeria

Oueld Hadj M.D.

ECOSYS Laboratory, Ouargla, University,
Ouargla, Algeria

Roussel C.

Chirosciences, UMR 7313, Stereo-Dyna.
Chiralty, Aix-Marseille Univ., France

Sidiqi S. K.

Bioorganometallic Lab., Dept. chemistry, AMU
University, New Delhi, India

Tabti B.

LASNABIO, Dept. Chemistry, University of
Tlemcen, Algeria

Youcefi M.

LSF laboratory, faculty of sciences, Laghouat
University, Algeria

Afaxantidis J.

Synerlab Développement,
Orléans, France

Allouch A.

Applied Chem. Lab., Faculty of Science Lebanese
University, Tripoli, Lebanon

Badjah A.Y.

Dept. Chem., College of Science,
King Saud Univ., Riyadh, KSA

Belboukhari N.

LMBSC Lab. Bechar university
Algeria

Bennaceur M.

Biochemical Laboratory, Biology faculty, Es Senia
University, Oran, Algeria

Bouchekara M.

Chemistry Laboratory, Science faculty, University of
Mascara, Algeria

Brada M.

Valuation of Natural Substances Lab., Khemis-
Miliana University, Algeria

Dadamoussa B.

Chemistry Laboratory, Ghardai University,
Algeria

Djebar S.

Materials & mineral laboratory, USTHB, Algiers,
Algeria.

Elachouri M.

Lab. Physiology and Ethnopharma...Sci.Fac Med. I
University. Oujda, Morocco

Ermel G.

Rennes University EA 1254, Beaulieu Campus
Rennes, France

Hacini S.

Fine Organic Chemistry laboratory, Es Senia
university, Oran, Algeria

Ghanmi M.

Medicinal plants division, CRF, Agdal
, Rabat, Morocco

Ghezali S.

IAP, Dept Catalysis, Sonatrach, Algiers,
Algeria

Kabouche Z.

LOST Laboratory, faculty of sciences, Constantine
University, Algeria

Kaid-Harche M.

Biotechnology Laboratory, Faculty of biology,
USTO, Oran, Algeria

Lahreche M.B.

LCO laboratory, faculty of Biology, Djelfa
University, Algeria

Meddah B.

Lab. Pharmaco. Toxic. Faculty of medicine and
pharmacy, Med. V Univ. Rabat, Morocco

Mushfik M.

Natural products laboratory, Dept chemistry, AMU
university, New Delhi, India

Rahmouni A.

LMC laboratory, Dept Chemistry, Saida University,
Algeria

Saidi M.

LPSEZA laboratory, Dept Chemistry, Ouargla
University, Algeria

Soltani Y.

BPO Laboratory, Endocrinology team, Dept. Bio.
Physio., USTHB, Algiers, Algeria,

Taleb S.

Materials Chemistry Laboratory
Dept Chem. UDL Univ., SBA, Algeria

Akkal S.

**Research Unity: VNRBM Lab. Dept. Chem.,
University of Constantine 1, Algeria**

Aouf N.

Lab. Applied Org. Chem. , Dpt. Chem.,
Annaba University, Algeria

Balansard G.

Pharmacognosy Lab., Faculty of pharmacy, Univ.
Aix Marseille II, Marseille, France

Belkhirri A.

Pharmacognosy Laboratory, Faculty of Medicine,
Constantine university, Algeria

Berredjem M.

Lab. Applied Org. Chem. , Dpt. Chem.,
Annaba University, Algeria

Bouklouze A.

Lab. Pharmaco. Toxic. Faculty of medicine and
pharmacy, Med. V Univ. Rabat, Morocco

Bressy C.

iSm2, CNRS UMR6263, Aix-Marseille University,
Marseille, France

Daich A.

URCOM, EA-3221, CNRS FR-3038, UFR Sci.
Tec., Normandie Univ, Le Havre, France

Djebli N.

Pharmacognosy, Api-Phytotherapy Lab.
Mostaganem University, Algeria

El Hatab M.

Natural products Laboratory, Science faculty, Blida
university, Algeria

Esnault M. A.

INRA, UMR 0118 RENN Vegetal Biotechnology
Lab., Rennes, France

Hadj Mahamed M.

BGCMD laboratory, Science Faculty,
Univ. Ouargla, Algérie

Gharabli S.

Chem. Lab., School of App. Med.Sciences,
German Jordanian University, Jordan

Jesus Aizpurua M.

Dept. Organic Chemistry-I, Univ. Basque Country
UPV/EHU, San Sebastian, Spain

Kacimi S.

Materials laboratory, Chemistry dept. Ain
Temouchent University, Algeria

Kessat A.

Analytical Laboratory, Central pharmacy
Rabat, Morocco

Leghseir B.

Phytochemistry laboratory, Faculty of science,
Annaba University, Algeria

Melhaoui A.

LCOMPN-URAC25, Fac. Scie., Mohamed I
University, Oujda, Morocco

Ouahrani M. R.

Faculty of Sciences & Technology, El-Oued
University, Oued Souf, Algeria

Reddy K.H.

Dept. Adv. Res. Center, Narayana Med.College,
Nellore, Andhra Pradesh, India

Salgueiro L.D

Lab. Farmacognosia, Fac. Farmacia, Univ. de
Coimbra, Coimbra, Portugal

Tabcheh M.

Applied Chem. Lab., Faculty of Science Lebanese
University, Tripoli, Lebanon

Villemin D.

LCMT lab., UMR CNRS 6507, ENSICAEN,
Caen, France.

Zyoud A.H.

Dept Chemistry, An-Najah N. University, Nablus,
West Bank, Palestine

Seasonal variation of essential oil yield and composition of *Juniperus phoenicea* grown at Djebel Amour region, Algeria

Boulanouar BAKCHICHE ^{*1}, Abdelaziz GHERIB ¹ & Mohamed MAATALLAH ²

¹Laboratory of Process Engineering, University of Laghouat, Algeria

²Faculté des Sciences Semlalia, University Cadi Ayyad, Marrakech, Maroc

Received: July 09, 2016; Accepted: October 21, 2016

Corresponding author Email: b.bakchiche@mail.lagh-univ.dz

Copyright © 2016-POSL

DOI:10.163.pcbjsj/2016.10.2.57

Abstract. Yield and composition of the essential oil obtained by hydrodistillation from the aerial parts of *Juniperus phoenicea* (Cupressaceae) have been studied. Plant material has been harvested during three different vegetative stages (before flowering, flowering and after flowering) to look for some correlation between composition and vegetative stage. The yields of oils in different stages were in the order of: before flowering (0.24%), flowering (0.74%) and after-flowering (0.40%). The oils were analyzed by gas chromatography-mass spectrometry. In total, 30, 35 and 35 constituents were identified and quantified in the oil of before flowering, flowering and after flowering plants, representing 99.44, 99.93 and 99.48% of the oils, respectively. α -pinene, α -phellandrene, Linalool, and Caryophyllene oxide were the main compounds in all samples. Monoterpenes were the main group of compounds in before flowering (59.88%), flowering (68.16%) and after flowering (69.39%) stages.

Key Words: *Juniperus phoenicea*, Essential oil, GC/MS, Hydrodistillation

1. Introduction

Essential oils are complex mixtures, constituted by terpenoid hydrocarbons, oxygenated terpenes and sesquiterpenes. They originate from the plant secondary metabolism and are responsible for their characteristic aroma. The species *Juniperus phoenicea* is considered as an important medicinal plant largely used in traditional medicine. Its leaves are used in the form of decoction to treat diarrhea, rheumatism and diabetes [1,2]. The mixture of leaves and berries of this plant is used as an oral hypoglycaemic agent [3], whereas the leaves are used against broncho-pulmonary disease and as a diuretic [1]. Previously, from the genus *Juniperus* some terpenoids have been isolated [4-7] neolignans

[4] and flavonoids [8]. There are many paper reports on chemical compositions of leaves and berries of essential oils of *J. phoenicea* grown in north Mediterranean basin [9]. In Morocco [10,11]; in Egypt [12], in Tunisia [13,14], in Algeria [8,15,16]. All oils of *J. phoenicea* have a high content of α -pinene. Data reported by [17], on the chemical composition of the essential oil from Spanish *Juniperus phoenicea* leaves showed that it was dominated by α -pinene (28.3%), β -phellandrene (25.3%), myrcene (7.2%), and α -phellandrene (4.1%) [18]. Vidrich and Michelozzi reported 1,8-cineol, α -pinene, and borneol as major components for an oil from an Italian *J. phoenicea* [19]. Rezzi et al. studied the composition of the essential oil from the leaves of *Juniperus phoenicea* from Corsica, and they found two different main compositions, identified as cluster I and cluster II, with the former being rich in α -pinene (70%) and the latter rich in α -pinene (33%), β -phellandrene (21.1%), and α -terpenyl acetate (8.2%) [20]. The essential oil composition of *J. phoenicea* depends on organs, seasons and methods [9,13]. This paper reports the first study of the seasonal variation of the essential oil composition of aerial parts of *Juniperus phoenicea* in different growth stages.

2. Materials and methods

2.1. Plant material

Aerial parts of *J. Phoenicea* were collected from Djabel Amour region, Central part of the Algerian saharan Atlas ((at 100 km at the west of Laghouat), during in three different times of growth plant (before flowering, flowering and after flowering stage) respectively, in April, October and January 2013, and were kept in dark at room temperature. The plants were identified with the contribution of the members of the laboratory of Process Engineering, University of Laghouat.

2.2. Isolation of the essential oil

The aerial parts (100 g) were dried at 25°C in the shade and subjected to hydrodistillation using a Clevenger-type apparatus for 4 h. The oil was dried with anhydrous sodium sulfate, weighed and stored at 4- 6°C in dark until use.

2.3. GC Analysis:

The essential oils were analyzed using a Shimadzu GC-2010 Gas chromatography equipped with a flame ionization detector (FID) and a DB-5 capillary column (30m x 0.25m, 1 μ m film thickness). Nitrogen was used as the carrier gas and the injector and detector temperatures were set at 220 and 280 °C respectively. The oven temperature was programmed from 60 to 230 °C at 3°C min⁻¹ and finally held at 230 °C for 10 min. The volume of oil injected was 1 μ l. Peak areas and retention times were measured by electronic integration.

2.4. GC/MS Analysis:

GC/MS data was obtained on the Gas Chromatography-Mass Spectrometry (GC-MS)-2010 Plus Shimadzu making use of the same column. The ion source temperature was kept at 250°C with

interface temperature at 280°C. The carrier gas used was helium. The temperature programming was same as in case of GC. Quantitative results are mean data derived from GC analysis. The mass range was 40 to 850 Dalton.

2.5. Identification of components

The linear retention indices for all the compounds were determined by coinjection of the sample with a solution containing the homologous series of C8 – C22 n-alkanes. The individual constituents were identified by their identical retention indices, referring to known compounds from the literature [17] and also by comparing their mass spectra with either the known compounds or with the Wiley mass spectral database.

3. Results and discussion

The essential oil contents of the aerial parts of *J. phoenicea*, obtained by hydro distillation, were 0.24%, 0.74% and 0.40% in before flowering, flowering and after flowering stages respectively, calculated on a dry weight basis. The components of the essential oils are reported in Table 1. Thirty components accounting for 99.44 % of the total composition were identified in before flowering stage. The major constituents of this oil were α -pinene (29.77 %), manoyl oxide (9.83%), α -phellandrene (7.65%), linalool (5.10%), caryophyllene oxide (5.05%) and elemol (4.15%). In the volatile of flowering stage, thirty-five compounds amounting 99.93 % of the total components were identified which included α -pinene (36.58 %), α -phellandrene (9.40%), caryophyllene oxide (5.54%), elemol (3.96%), β -Caryophyllene (3.72%), Linalool (3.65%) and β -pinene (3.17%) as main components. In the oil obtained from after flowering stage, thirty-five components were identified, which represented about 99.48 % of the total composition. α -pinene (33.29%), α -phellandrene (10.88%), β -myrcene (3.24%), β -pinene and Linalool (3.12%) were the principal components of this oil.

The majority of the identified compounds belonged to the monoterpene fraction (Table 2), with percentages ranging from 59.88% in before flowering stage, to 68.16 % in the flowering stage and 69.39% in after flowering stage. The hydrocarbons fraction was mainly composed of monoterpenes and the flowering stage oil had the highest percentage of hydrocarbons monoterpene. The results from this study show that oils obtained from the different phenological stages have nearly similar compositions; the main compounds were α -pinene, α -phellandrene, Linalool, and Caryophyllene oxide. Thus the time of harvesting of this plant does not have a major effect on the chemical composition of the essential oil, but it affects the essential oil content of the plant. The flowering stage is the best time for harvesting the plant because at this time the plant contains the highest percentage of essential oil.

4. Conclusion

A comparison of the chemical composition of the essential oil from the aerial parts of *J. phoenicea*, at three stages of development shows that there are little differences in composition and major components, α -pinene, α -phellandrene, Linalool, and Caryophyllene oxide were the main compounds

in all samples. Thus the time of harvesting of this plant does not have a major effect on chemical composition of the essential oil but it effects on the essential oil content of the plant and the flowering stage is the best time for harvesting the plant and obtaining the essential oil because at this time the plant contains highest percent of the essential oil.

Table 1. The chemical composition of the essential oils of *J. phoenicea* in different growth stages.

No.	Components	KI	Before flowering stage	Flowering stage	After flowering stage
1	Tricyclene	919	-	1.01	0.62
2	α – Pinene	939	29.77	36.58	33.29
3	Camphene	953	0.94	0.99	1.82
4	Verbenene	967	1.04	1.09	0.52
5	β – Pinene	981	2.25	3.17	3.12
6	β – myrcene	992	1.24	1.46	3.24
7	α – phellandrene	1005	7.65	9.40	10.88
8	p-Cymene	1027	1.25	1.30	2.10
9	γ -Terpinene	1056	0.15	0.20	0.49
10	Linalool	1074	5.10	3.65	3.12
11	Fenchone	1087	1.14	-	0.91
12	Trans-Rose oxide	1111	0.49	0.41	0.28
13	Trans-Pinocarveol	1139	1.34	1.47	1.05
14	Camphor	1143	-	0.39	1.59
15	Pinocarvone	1162	0.36	0.23	-
16	Naphthalene	1179	0.26	0.50	0.59
17	Citronellol	1233	3.34	2.94	1.94
18	Linalyl acetate	1261	3.36	1.66	2.16
19	Isopulegyl acetate	1273	-	0.84	1.42

20	γ -Elemene	1336	-	0.43	0.36
21	α -copaene	1376	1.49	1.02	1.05
22	β -bourbonene	1384	t	0.61	0.32
23	β -Elemene	1391	1.44	1.52	0.96
24	β -Caryophyllene	1418	2.80	3.72	3.79
25	α -cubebene	1451	1.27	1.33	1.16
26	α -Humulene	1467	-	1.95	2.02
27	Germacrene D	1480	1.44	1.65	1.88
28	α -amorphene	1514	1.16	1.50	2.04
29	γ -Cadinene	1520	-	0.12	1.53
30	δ -Cadinene	1524	-	-	3.84
31	Valencene	1539	5.05	-	-
32	Elemol	1547	4.15	3.96	-
33	Germacrene B	1560	-	-	2.38
34	Citronellyl acetate	1563	0.70	0.87	0.25
35	Caryophyllene oxide	1581	5.05	5.54	2.61
36	Humulene oxide	1596	2.19	2.41	1.13
37	β -Eudesmol	1630	3.31	3.47	3.08
38	Spathulenol	1619	0.31	0.22	-
39	Manoyl oxide	1989	9.83	2.43	1.91
	Total identified		99.44	99.93	99.48
	Yield (%)		0.24	0.74	0.40

KI = linear Kovats Index on DB-5 column.

Table 2. Percentages of the main chemical classes of volatiles.

Chemical class	Before flowering stage	Flowering stage	After flowering stage
Monoterpene hydrocarbons	50.44	60.11	60.41
Oxygenated monoterpenes	9.44	8.05	8.98
Sesquiterpene hydrocarbons	14.65	13.85	21.33
Oxygenated sesquiterpenes	24.39	18.03	8.73

Acknowledgement

The authors would like to thank Prof. Luís V. Boas of the Instituto de Tecnologia Química e Biológica (ITQB), Oeiras, Portugal for identification of the plant.

References

- Bellakhder J (1997). *La Pharmacopée Marocaine traditionnelle*. Paris: Ibis Press. 272.
- Allali H, Benmehdi H, Dib MA, Tabti B, Ghalem S, Benabadji N (2008). *Asian J. Chem.* 20: 2701-2710.
- Amer MMA, Wasif MM, Abo-Aytta AM (1994). *J. Agric. Res.* 21: 1077-1091.
- Nakanishi T (2005). *Tetrahedron Lett.* 46: 6533-6535.
- Martin AM, Queiroz EF, Marston A, Hostettmann K (2006). *Phytochem. Anal.* 17: 32-35.
- Okasaka Mamoru, Yoshihisa Takaishi, Yoshiki Kashiwada, OlimjonK. Kodzhimatov, Ozodbek Ashurmetov, Ai J Lin, L Mark Consentino, Kuo-Hsiung Lee (2006). *Phytochemistry.* 67: 2635-2640.
- Mansouri N, B Satrani, M Ghanmi L. El Ghadraoui A. Aafi A. Farah (2010) 8: 166-170.
- Inatomi Y, Iida N, Murata H, Inada A, Murata J, Lang FA, Iinuma M, Tanaka T, Mazari K, Bendinerad N, Benkhechi C, Fernandez X (2010). *Medicinal Plants Research.* 4(10): 959-964.
- Ennajar Monia, Bouajila Jalloul, Lebrihi Ahmed (2010). *Journal of the science of Food and agriculture.* 90(3): 462-470.
- Derwich E, Z Benziane, Taouil R, Senhadji O, Touzani MA (2010). *Middl-East J. Res.* 5(5): 416-424.
- Ait Ouazzou Abdenour, Loran Susana, Arakrak Abdelhay, Laglaoui Amin, Rota Carmen, Herrera Antonio, Pagan Rafael, Conchello Pilar (2012). *Food research international.* 45(1): 313-319.
- El-Sawi SA, Motawae HM, Amal MA (2007). *African J. of Traditional, Complementary and Alternative Medicines.* 4(4): 417-426.
- Ennajar Monia, Romdhane Mehrez, Abderrabba Manef (2007). *Revue des régions arides (Tunis).* 2: 647-651.
- Medini H, Elaissi A, Chraif I, BannourF, Farhat F, Ben salah M, Khoudja ML, Chemli R (2007). *Revue des régions arides .* 1: 185-189.

15. Dob Tahar, Dahmane Dahmane, Chelghoum Chaabane (2008). The Journal of essential oil research, 20(1): 15–20.
16. Bekhechi Chahrazed, Atik Bekkara Fewzia, Consiglio Danaë, Bighelli Ange, Tomi Félix (2012). Chemistry & biodiversity. 9(12): 2742–2753.
17. Adams RP, (1995).Allured: Carol Stream, IL.
18. Adams R.P., Barrero A.F. & Lara A., (1996). Parl. Essent. Oil Res., 8, 367-371.
19. Vidrich, V., Michelozzi, M.,(1993).. Italia Forestale e Montana 48 (2), 133–140.
20. Rezzi, S., Cavaleiro, C., Bighelli, A., Salgueiro, L., Proença da Cunha, A., Casanova, J., 2001. Syst. Ecol. 29, 179–188.

PhytoChem & BioSub Journal

Peer-reviewed research journal on Phytochemistry & Bioactives Substances

ISSN 2170 - 1768



*PCBS
Journal*


ISSN 2170-1768



Edition LPSO - Phytochemistry & Organic Synthesis Laboratory-

<http://www.pcbsj.webs.com>

<https://sites.google.com/site/phytochembsj/>

Email: phytochem07@yahoo.fr